Ultra-Lightweight, High Efficiency Silicon-Carbide (SIC) Based Power Electronic Converters, Phase II

Completed Technology Project (2005 - 2007)

Project Introduction

In Phase I of this project, APEI, Inc. proved the feasibility of creating ultra-lightweight power converters (utilizing now emerging silicon carbide [SiC] power switching technologies) through the successful demonstration of power switch operation up to 500

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C. The goal of Phase II will be to design, fabricate, and fully test SiC based DC/DC converters that can achieve high power density and ultra-lightweight by operating the power switches at high junction temperatures. Present state-of-the-art silicon based spacecraft power systems operate at a power density of approximately 1.5 W/cm?, while the high temperature SiC based power converters proposed by APEI, Inc. in this project will operate at a power density of approximately 4.5 W/cm?, or 3? the density of present high performance silicon based systems. Theoretically, if the full potential of silicon carbide switches could be realized (junction temperature operation in excess of 600

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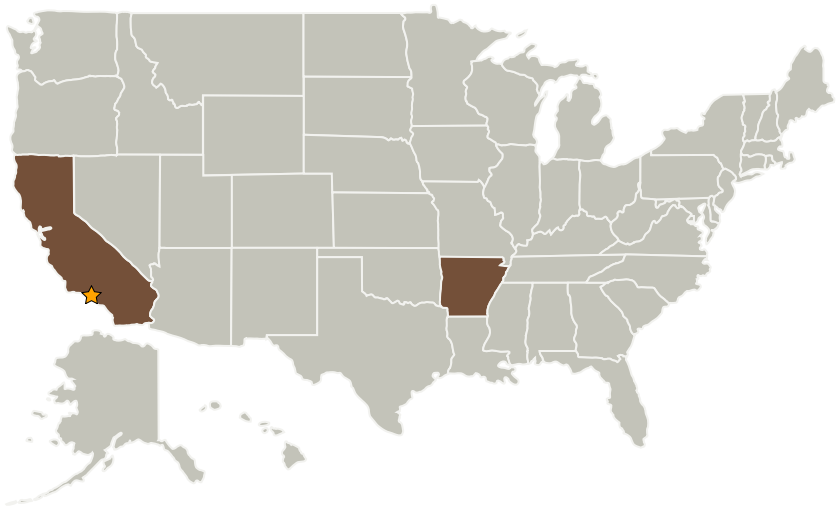
C), an order of magnitude power density improvement could be achieved. APEI, Inc. is proposing to fabricate up to three prototype high density (4.5 W/cm?) DC/DC converter designs: (1) 28V in / 5V out @ 25 watts (2) 28 V in / 5V out @ 100 watts (3) 28 V in / 5V out @ 1 kW

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
Arkansas Power Electronics International, Inc.	Supporting Organization	Industry	Fayetteville, Arkansas

Primary U.S. Work Locations	
Arkansas	California

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.1 Software Development, Engineering, and Integrity
    - TX11.1.6 Real-time Software